RADIOISOTOPE BRIEF

Cesium-137 (Cs-137)

Half-life: 30.17 years

Mode of decay: Beta and gamma radiation

Chemical properties: Liquid at room temperature, but readily bonds with chlorides to form a powder.

Beta particles are subatomic particles that are ejected from the nucleus of unstable atoms. Beta particles can travel through several layers of human skin, and exposure to large sources of beta radiation can cause burns or skin reddening. Beta particles that enter the body can damage cells, which can lead to cell death or, later in life, to cancer.

Gamma radiation is a packet of energy, called a photon, that is emitted from the nucleus of an unstable atom. Gamma radiation is high-energy electromagnetic radiation that can penetrate most substances (lead is the best barrier against gamma radiation). Because of its high energy, gamma radiation can penetrate the human body from the outside and damage cells, which could lead to cancer later in life.

What is it used for?

Cs-137 is used in small amounts for calibration of radiation-detection equipment, such as Geiger-Mueller counters. In larger amounts, Cs-137 is used in medical radiation therapy devices for treating cancer; in many industrial gauges that detect the flow of liquid through pipes; and in other industrial devices to measure the thickness of materials, such as paper, photographic film, or sheets of metal.

Where does it come from?

Cs-137 is produced by nuclear fission for use in medical devices and gauges. Cs-137 also is one of the byproducts of nuclear fission processes in nuclear reactors and nuclear weapons testing. Small quantities of Cs-137 can be found in the environment from nuclear weapons tests that occurred in the 1950s and 1960s and from nuclear reactor accidents, as in 1986 when wind currents distributed Cs-137 to many countries in Europe after the Chernobyl power plant accident.

What form is it in?

Because it readily bonds with chlorides, Cs-137 usually occurs as a crystalline powder, rather than in its pure liquid form.

What does it look like?

Small amounts of Cs-137 are incorporated into Lucite disks, rods, and seeds. Larger Cs-137 sources are enclosed in lead containers (such as long tubes that are closed at each end) or small round metal containers. If the lead containers of Cs-137 are opened, the substance inside looks like a white powder and may glow. Cs-137 from nuclear accidents or atomic bomb explosions cannot be seen and will be present in dust and debris from fallout.

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How can I be exposed to Cs-137?

Small amounts of Cs-137 are present in the environment from weapons testing in the 1950s and 1960s, so people are exposed to some Cs-137 every day. However, Cs-137 is dangerous in the large, concentrated amounts found in radiation therapy units and industrial gauges. The sources in these devices are designed to remain sealed and keep people from being exposed; however, if these canisters are intentionally or accidentally opened, the Cs-137 inside could be dispersed

How can it hurt me?

External exposure to large amounts of Cs-137 can cause burns, acute radiation sickness, and even death. Exposure to Cs-137 can increase the risk for cancer because of exposure to high-energy gamma radiation. Internal exposure to Cs-137, through ingestion or inhalation, allows the radioactive material to be distributed in the soft tissues, especially muscle tissue, exposing these tissues to the beta particles and gamma radiation and increasing cancer risk.

For more information about Cs-137, see the Public Health Statement by the Agency for Toxic Substances and Disease Registry at http://www.atsdr.cdc.gov/toxprofiles/phs149.html, or visit the Environmental Protection Agency at http://www.epa.gov/radiation/radionuclides/cesium.htm.

For more information about health effects related to uranium exposure, see CDC's fact sheet on "Radiation and Health Effects," at www.bt.cdc.gov/radiation/healthfacts.asp.

For more information on protecting yourself before or during a radiologic emergency, see CDC's fact sheet titled "Frequently Asked Questions (FAQs) About a Radiation Emergency" at www.bt.cdc.gov/radiation/emergencyfaq.asp, and "Sheltering in Place During a Radiation Emergency," at www.bt.cdc.gov/radiation/shelter.asp.

For information on other radiation emergency topics,
visit www.bt.cdc.gov/radiation, or call the CDC public response hotline
at (888) 246-2675 (English), (888) 246-2857 (Español), or (866) 874-2646 (TTY)

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